

Name: _____

Physics 103 Elementary Physics I

Second Examination: Wednesday 8 November 2023, 10:00 AM–10:50 AM

- This exam consists of **four** problems, each of which is worth **ten** points, and you have **fifty minutes** in which to work them.
- You may not discuss the exam with anyone other than me. If you find a problem statement unclear, visit me in the hallway immediately outside of the lecture hall.
- You may consult one $8\frac{1}{2}$ by 11 inch page of your own notes, but no other material. Calculators are permitted, collaboration is not.
- Solutions must be complete enough that I can follow the logic. Use the English language when appropriate.
- If you need extra paper or scrap paper you may obtain it from the stock at the front desk. Staple all extra pages that you use (including scrap pages) to this exam when you hand it in.
- Adhere to the requirements of the honor system. Sign the honor pledge below.

Dan Styer

I have adhered to the Honor Code in this assignment.

	points earned	maximum
problem 1		10
problem 2		10
problem 3		10
problem 4		10
total		40

Note well! In all the problems in this exam:

- I expect you to use significant figures.
- Use $g = 9.807 \text{ m/s}^2$ (appropriately rounded).

1. *Red light.*

A car of mass $1.53 \times 10^3 \text{ kg}$ is traveling at 8.94 m/s (that is 20.0 mph) when the driver notices a red light 23.4 meters ahead and immediately applies the breaks. The breaks supply $3.82 \times 10^3 \text{ N}$ of breaking force. How far does the car travel before coming to rest?

2. *Baseball.*

During a Rangers - Diamondbacks World Series game, pitcher Nathan Eovaldi accelerates a 0.14 kg hardball from rest to 42 m/s in 0.062 s. How much work does Eovaldi do on the ball?

3. *Firecracker.*

Two carts — a red cart with mass m_r and a blue cart with mass m_b — sit on the table with a small firecracker sandwiched between them. The firecracker explodes and the two carts fly apart from each other. Find an expression for the ratio of the kinetic energy of the red cart to the kinetic energy of the blue cart.

4. *Rescue.*

Tarzan (mass 85.4 kg) stands on a tree limb 12.4 meters above the Zambezi River when he glances down to see a child in a canoe drifting slowly toward Victoria Falls. He grabs a convenient vine, swings down, and snatches the child out of the canoe just as it is about to go over the verge of the waterfall. (Funny how that works out.) The vine is fortunately of the exact right length that Tarzan is traveling horizontally at the river surface. (Funny how that works out.) The Tarzan-child combination travels at speed 13.1 m/s immediately after the snatch. What is the mass of the child?